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ABSTRACT

Although today's schools are rapidly acquiring computers and increasingly relying on them for instructional purposes, training of teachers to use computers in the classroom has not kept up with this trend. If teachers are to be held accountable for integrating computers into their instructional repertoire, they deserve systematic exposure to technological enhancements at all levels of a coherent, interrelated preservice curriculum. Teacher education programs vary in their approach to helping preservice teachers to develop computer competency. The education faculty at the College of Saint Elizabeth (New Jersey) developed a project to establish a teacher education curriculum in which computers would be systematically integrated throughout course content and field experiences. Computer skills, knowledge, and competencies would be acquired by students through a developmental process spanning four stages: awareness, adaptation, analysis, and application. These stages and accompanying activities correspond to the 4-year comprehensive teacher education curriculum. An outline of program goals and activities identifies competencies, supported by behavioral objectives, that correspond to each of the four stages in the developmental process. The integration of computer competencies within the curriculum focused on three major areas: curriculum and evaluation, student learning and development, and the classroom and school. The college's Department of Education has also established a Teacher Education Computer Laboratory containing computers, a catalogued software collection, professional journals, and audiovisual equipment. Every course in the education curriculum integrates into the course content hands-on assignments and projects that require computer utilization. (IAH)

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TECHNOLOGY IN THE CURRICULUM: THE INCLUSION SOLUTION

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TECHNOLOGY IN THE CURRICULUM: THE INCLUSION SOLUTION

Introduction. Long before the technology "explosion" of the twentieth century, educational instruction included a succession of technologies tailored for classroom practice (Cuban, 1986). Cuban (1986) stated that chalk and slate, books and pictures were nineteenth century media. These were used to expand "teacher talk" into more visual modes for the transfer of facts and concepts. Within our present day memories, films, radio, tape recorders, television, and computers have become the "tool" choices for teachers. Today schools are rapidly acquiring computers and increasingly relying on them for instructional purposes (Jongejan, 1990; Munday, Windham, & Stamper, 1991; Hasselbring, 1991; and Wiburg, 1991.

Unfortunately, the training of teachers in the use of modern technology has not kept up with the existing trend in schools. Norvak and Berger (1991) asserted that teacher educators and policy makers are becoming increasingly aware of the need to integrate technology into preservice education programs. Collis (1988), in her research findings, reported strong evidence for the inclusion of technology education in teacher education and for the continued important role of the teacher:

> The second message that comes through repeatedly when I read the research literature is the central importance of the teacher in any kind of computer utilization... We see from both research and practice that the teacher is probably the critical variable in all of these open-ended types of computer use. The teacher must find an appropriate and meaningful use of the computer application relative to the content to be conveyed through the computer use, to the characteristics...of the students, and to the overall style of instructional organization and management the teacher prefers... It is my personal belief that the teacher remains, as always, the major influence on the effectiveness of any sort of computer usage in schools (p.6).

A recent survey conducted by the American Association of Colleges for Teacher Education (1987) indicated that less than one third (20%) of teachers entering the profession perceived themselves to be prepared to teach with computers (Hasselbring, 1991). And yet teachers are faced with the realities that school districts demand they use technology, parents expect them to use it, and students want them to use it (Norvak and Berger, (1991).

Computer Competency for Preservice Teachers. The logical question that follows this discussion is: How do we do it? Some teacher education programs offer one course in technology, others describe general competencies to be met both within the teacher education courses and in the required general education courses, still others integrate competencies and goals within all courses (Moore, 1984; Munday, Windham, & Stamper; Norvak & Berger, 1991; Nelson, Andris, & Keefe, 1991; & Wiburg, 1991). However, Nelson, Andris, and Keefe (1991) pointed out that one course in computer literacy is not enough experience and knowledge to insure that computer applications are integrated into the total curriculum for teacher preparation. Students need appropriate training before they can be held accountable for the decisions they make to integrate computers into their classrooms. In fact, a report of a task force, sponsored by the University of Michigan to study how best to prepare teachers in the use of technology, offered these goals for preservice technology education: (1) the operation of equipment, (2) application of technology to instructional management, (3) application of technology to classroom instruction, and (4) development of positive attitudes toward instructional technology (Norvak and Berger, 1991). Finally, a report on the findings of a project by the Northwest Council for Computer Education (NCCE) to develop a set of guideline competencies for the certification of all teachers suggested that these competencies be included in both general education requirements and in computer education in particular (Moore, 1984).

Clearly, teachers will be more productive with students and develop effective teaching practices if given the opportunity to learn about technologies (Munday, Windham, & Stamper (1991). Brooks and Kopp (1989) stated that if first-year teachers are expected to be creative and facile with technology, they deserve systematic exposure to technological enhancements at all levels of coherent, interrelated preservice curriculum.

The Inclusion Solution at The College of Saint Elizabeth. In 1986 Education faculty at the College of Saint Elizabeth met to discuss in particular the need for expansion of computer use in the department. A project for such expansion was forwarded through several grant fundings. The goal was to establish a teacher education curriculum in which computers would be systematically integrated throughout course content and field experiences. In this way computer skills, knowledge, and competencies would be acquired by means of a developmental process spanning four stages: awareness, adaptation, analysis, and application. These stages and accompanying activities correspond to the four year comprehensive teacher education curriculum. Additionally, the faculty would receive instruction through a series of workshops for the development of computer techniques for utilization in all the courses of the teacher education curriculum.

There were three major foci of the goal of the project: (1) curriculum and evaluation, (2) student learning and development,

and (3) the classroom and school. Within each category are skills, knowledge, and competencies which preservice teachers would acquire by means of a developmental process. Such systematic exposure to computer technology would "normalize" the use of the computer in the teaching/learning process. It was projected that such normalization would diminish the use of the computer as an isolated tool in the classroom, and instead enable the preservice teacher to integrate technology into the elementary curriculm.

The College's Department of Education has established a Teacher Education Computer Laboratory (TECL). Holdings include 16 Apple IIe computers hooked up to four printers, 2 Apple IIgs computers and Imagewriters, and 1 Macintosh with Laser printer. A catalogued software collection with backup disks includes instructional, word processing, graphics, diagnostic, and other programs for use in teaching elementary, early childhood, K-12, and/or special education. A collection of software catalogues and professional journals is available. A Kodak Data-Show System and overhead screen are housed here for instructional purposes as is a VCR and camcorder for peer evaluation of practice teaching and microteaching.

Instruction in the use of computers is integrated into the regular course offerings of the Education Department, provided by a part-time Director of the lab. Students assemble in the lab for special instruction related to course objectives and assignments. Students also use TECL for independent projects, word-processing assigned reports, software evaluation, analysis and graphing of research data, and curriuculum planning.

Program Goals and Activities.

Stage One -- Awareness

1. visitations to school settings where preservice teachers observe and record the use of computer technology
    a. identify elementary schools with computer usage integrated within the school curriculum
    b. spend 1/2 day visitations observing student learning and development through computer usage
    c. spend 1/2 day visitations observing computer usage for exceptional children
    d. review/evaluate selected computer software
    e. submit a journal of observations using desk-top publishing software

2. recognition of the computer as a "normal" educational tool
    a. research the literature related to use of technology within school curricula for student learning and development
    b. submit reactionnaires to the research developing the relationship between computers and instruction as observed in the field

3. acquisition of computer literacy
   a. enroll in course(s) on basic computer usage
   b. use word processing program for reactionnaires
   c. review/evaluate software for computer-assisted instruction
   d. use desk-top publishing techniques

Stage Two -- Adaptation

1. apply learning theories to computer analysis of student behaviors
   a. examine and play computer games that develop deductive reasoning and problem solving skills
   b. evaluate software relating to development of logical thinking skills, sharpening perceptions, memory development, cognitive styles, and independent living and personality development for the exceptional child

2. hands-on experiences with computer assisted instructional techniques
   a. develop teacher-made tests for drill
   b. computer-assisted educational interpretation of test results
   c. review/evaluate related educational software

3. interpretation of standardized tests and teacher developed instruments
   a. administer standardized test
   b. create data file
   c. use computer-assisted interpretation
   d. develop individualized educational program
   e. develop individualized implementation plan

4. implications of technology for individual and group learning
   a. examine use of "hands-on" programs for independent learning
   b. evaluate computer games for groups
   c. research the literature/write reactionnaires (using word processing programs) addressing teaching/learning modalities

5. computer use in order to enhance student interest and motivation
   a. evaluate programs that challenge creativity
   b. apply use of computer games that develop readiness skills
   c. use animated programs for learning basic skills

Stage Three -- Analysis

1. evaluate computer techniques and materials for instruction in reading and language arts

a. review/evaluate related educational software
b. research the literature related to computer use in the content area
c. submit reactionnaires completed with a word-processing program

2. increase diagnostic skills through computer analysis of reading deficiencies
   a. analyze readability levels of written material
   b. pretest one student during micro-teaching class in major reading skill areas
   c. analyze reading difficulties
   d. develop remediation program

3. evaluate software in the content areas of the elementary curriculum
   a. review/evaluate selected software
   b. integrate selected software into micro-teaching lessons

4. relate computer games to increasing learning, student interest, motivation, and social skills
   a. review/evaluate computer games
   b. integrate games into micro-teaching lessons

5. acquire computer techniques to be used with students with special needs
   a. relate behavior modification techniques to alloted computer time
   b. review/evaluate hardware and software computer technology for special education

6. use word processing for developing writing skills in children
   a. introduce word processing programs to children during micro-teaching lessons
   b. develop and implement written expression lesson plans using childrens' word processing programs
   c. review/evaluate related software

Stage Four -- Application

1. use computer management and record keeping systems
   a. review/evaluate selected software programs
   b. use computer management/record keeping system during student teaching

2. develop and use alternate forms of assessment
   a. review/evaluate computer programs
   b. develop pre-test in content area for a special needs learner; provide computer assisted instruction; administer post-test; provide analysis of plan

3. use computer programs to establish a data base for

research projects

a. compile data file
b. use statistical package for data analysis
c. apply results to child's needs
d. develop prognosis and remediation plan
e. develop survey instrument
f. report findings and use statistical package for graphing results

All students in the College's teacher education program are affected positively by this program. Every course in the education curriculum integrates hands-on assignments and projects using the computer into the course content. Course assignments require students to develop computer competency according to the four stages discussed above. Along with computer competency, students are required to develop skills with the camcorder, overhead projector, film, slides, and duplicating systems. They are required to video-tape their practice teaching assignments; self-evaluate their performance; and edit the tape at the campus video studio for peer review and critique in class. Use of technology within the video-taped lesson is evaluated.

Preservice teachers, then, competent in technological skills, will apply modern technology to the teaching/learning process in the classroom. Additionally, as certified teachers they will be assets to school districts which have made significant financial investments in hardware and software for the purpose of integrating computer technology into education.

Summary. In many ways technology has helped to improve instruction in schools. When used effectively by the classroom teacher student learning and productivity can be enhanced. However, Hasselbring (1991) reminds us that much more research must be conducted in order to understand the relationship between human learning and technology which results in improved instruction. He asserts that presently there is a lack of empirical evidence with respect to how emerging technologies enhance or influence learning. As the use of these strategies increase in classrooms it becomes a matter of great importance that technology and learning relationships be thoroughly explored and understood (Hasselbring, 1991).

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